

ABSTRACT OF THE DISCLOSURE

A method for evaluating a material specimen comprises: Mounting a neutron source and a detector adjacent the material specimen; bombarding the material specimen with neutrons from the neutron source to create prompt gamma rays within the material specimen, some of the prompt gamma rays being emitted from the material specimen, some of the prompt gamma rays resulting in the formation of positrons within the material specimen by pair production; collecting positron annihilation data by detecting with the detector at least one emitted annihilation gamma ray resulting from the annihilation of a positron; storing the positron annihilation data on a data storage system for later retrieval and processing; and continuing to collect and store positron annihilation data, the continued collected and stored positron annihilation data being indicative of an accumulation of lattice damage over time.